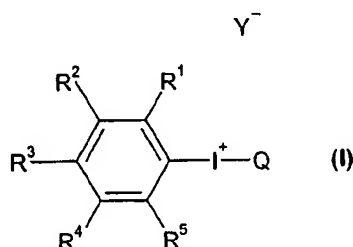


# Claims

- 1) A method for the production of an aromatic fluorine-labelled compound comprising fluoridation of an iodonium salt with a fluoride ion source characterised in that the reaction mixture contains a free radical trap.
- 5 2) The method of claim 1 wherein the free radical trap is selected from 2,2,6,6-Tetramethylpiperidine-N-Oxide, 1,2-diphenylethylene, ascorbate, para-amino benzoic acid,  $\alpha$ -tocopherol, hydroquinone, di-t-butyl phenol,  $\beta$ -carotene and gentisic acid.
- 3) The method of either of claims 1 or 2 wherein the free radical trap is 2,2,6,6-Tetramethylpiperidine-N-Oxide or 1,2-diphenylethylene.
- 10 4) The method of any of claims 1-3 wherein the fluoride ion source is selected from potassium fluoride, caesium fluoride and tetraalkylammonium fluoride.
- 5) The method of claim 4 wherein the fluoride ion source is potassium fluoride and Kryptofix<sup>TM</sup> is used to activate the fluoride ion.
- 6) The method of any of claims 1-5 wherein the iodonium salt is of Formula I:



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wherein:

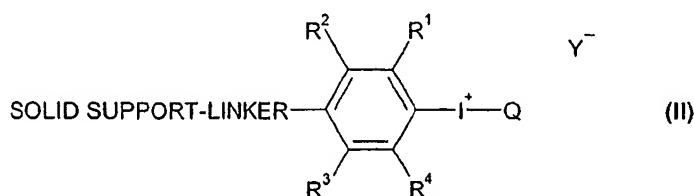
Q is a precursor of the fluorine-labelled compound ;

20 R<sup>1</sup>-R<sup>5</sup> are independently selected from hydrogen, nitro, cyano, halogen, C<sub>1-10</sub> hydroxyalkyl, C<sub>2-10</sub> carboxyalkyl, C<sub>1-10</sub> alkyl, C<sub>2-10</sub> alkoxyalkyl, C<sub>1-10</sub> hydroxyalkyl, C<sub>1-10</sub> aminoalkyl, C<sub>1-10</sub> haloalkyl, C<sub>6-14</sub> aryl, C<sub>3-12</sub> heteroaryl, C<sub>3-20</sub> alkylaryl, C<sub>5-12</sub> arylene, C<sub>2-10</sub> alkenyl, C<sub>2-10</sub> alkynyl, C<sub>1-10</sub> acyl, C<sub>7-10</sub> aroyl, C<sub>2-10</sub> carboalkoxy, C<sub>2-10</sub> carbamoyl, C<sub>2-10</sub> carbamyl, or C<sub>1-10</sub> alkylsulphinyl, or protected versions of any of

these groups; or alternatively forms a four- to six-membered ring together with the R group to which it is adjacent, or protected versions thereof; and,

$Y^-$  is an anion selected from triflate, nonaflate, mesylate and hexaflate.

- 7) The method of any of claims 1-5 wherein the iodonium salt is solid support-bound as in Formula II:



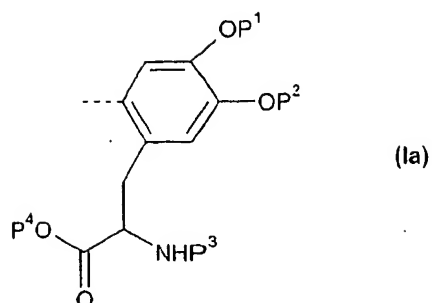
wherein:

Q is a precursor of the fluorine-labelled compound; and,

$R^1$ - $R^4$  and  $Y^-$  are as defined for Formula I of claim 6.

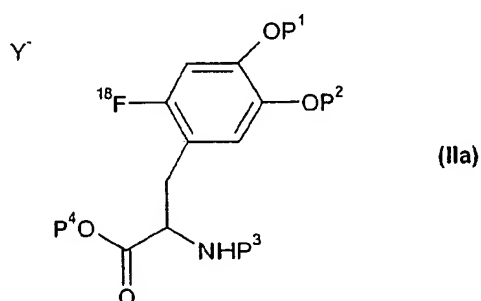
- 8) The method of either of claims 6 or 7 wherein Q is an aryl group optionally substituted by 1 to 5 substituents independently selected from nitro, cyano, halogen,  $C_{1-10}$  hydroxyalkyl,  $C_{2-10}$  carboxyalkyl,  $C_{1-10}$  alkyl,  $C_{2-10}$  alkoxyalkyl,  $C_{1-10}$  hydroxyalkyl,  $C_{1-10}$  aminoalkyl,  $C_{1-10}$  haloalkyl,  $C_{6-14}$  aryl,  $C_{3-12}$  heteroaryl,  $C_{3-20}$  alkylaryl,  $C_{5-12}$  arylene,  $C_{2-10}$  alkenyl,  $C_{2-10}$  alkynyl,  $C_{1-10}$  acyl,  $C_{7-10}$  aroyl,  $C_{2-10}$  carboalkoxy,  $C_{2-10}$  carbamoyl,  $C_{2-10}$  carbamyl, or  $C_{1-10}$  alkylsulphinyl, or protected versions of any of these groups; or alternatively forms a four- to six-membered ring together with the R group to which it is adjacent, or protected versions thereof.
- 9) The method of any of claims 1-8 wherein the fluorine-labelled compound is an  $[^{18}F]$ -labelled compound and the fluoride ion source is a source of  $^{18}F^-$ .
- 10) The method of claim 9 wherein the  $[^{18}F]$ -labelled compound is  $[^{18}F]$ -FDOPA.
- 11) The method of any of claims 6-10 wherein the precursor is of Formula Ia:

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wherein P<sup>1</sup>, P<sup>2</sup>, P<sup>3</sup>, and P<sup>4</sup> are each independently hydrogen or a protecting group;

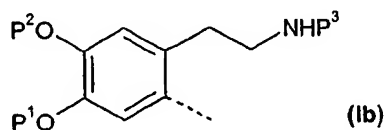
said method producing the labelled compound of Formula IIa:



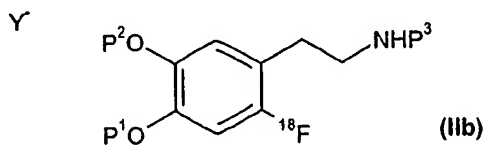
- 5 wherein P<sup>1</sup>, P<sup>2</sup>, P<sup>3</sup>, and P<sup>4</sup> are each independently hydrogen or a protecting group and Y<sup>-</sup> is an anion, preferably trifluoromethylsulphonate (triflate) anion.

12) The method of claim 9 wherein the [<sup>18</sup>F]-labelled compound is [<sup>18</sup>F]-dopamine.

13) The method of any of claims 6-10 and 12 wherein the precursor is of Formula Ib:



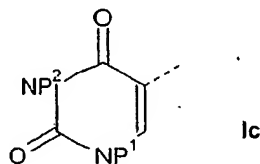
- 10 wherein P<sup>1</sup>, P<sup>2</sup>, and P<sup>3</sup> are each independently hydrogen or a protecting group;
- said method producing the labelled compound of Formula IIb:



wherein  $P^1$ ,  $P^2$ , and  $P^3$  are each independently hydrogen or a protecting group and  $Y^-$  is an anion, preferably trifluoromethylsulphonate (triflate) anion.

14) The method of claim 9 wherein the  $[^{18}\text{F}]$ -labelled compound is  $[^{18}\text{F}]$ -uracil.

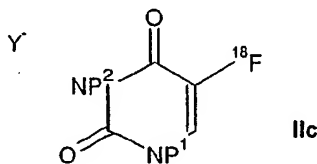
15) The method of any of claims 6-10 and 14 wherein the precursor is of Formula Ic:



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wherein  $P^1$  and  $P^2$  are each independently hydrogen or a protecting group;

said method producing the labelled compound of Formula IIc:



wherein  $P^1$  and  $P^2$  are each independently hydrogen or a protecting group and  $Y^-$  is an anion, preferably trifluoromethylsulphonate (triflate) anion.

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16) The method of any of claims 9-15, further comprising:

- (i) removal of excess  $^{18}\text{F}^-$ , for example by ion-exchange chromatography; and/or
- (ii) removal of the protecting groups; and/or
- (iii) removal of organic solvent; and/or
- (iv) formulation of the resultant compound as an aqueous solution.

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17) An  $[^{18}\text{F}]$ -labelled compound produced by the method of any of claims 1-16.